ART. VII.—*On the Geographic Distribution of the Vulturidæ, Falconidæ, and Strigidæ; being the first of a series of memoirs intended to illustrate the Geographic Distribution of the Ornithological Kingdom. By* WM. JAMESON, ESQ. *Assistant Surgeon Bengal Medical Service, &c.*

Of all the departments of zoology, there is probably not one which has attracted less the attention of naturalists than that of the geographic distribution of the animal kingdom; although from a study of it many details may be derived of essential importance to several of the other branches of natural history. To elucidate partially the distribution of one division of zoology, viz. ornithology, is the subject of the series of memoirs intended to be presented to the Society.

In entering upon a subject like the present, we do so with the greatest diffidence, from the confusion which has existed, and still reigns in the systematic department of ornithology. The number of synonymous genera—some authors applying a certain suite of characters to a particular genus, others another suite either more or less extensive, and some applying the name, but at the same time ignorant of the characters upon which the genus is based, of which we have many examples, and these too in works published at the present day—have presented to us difficulties of no ordinary nature. To overcome these, we have examined minutely the magnificent collection in the Edinburgh Royal Museum, as well as the principal public and private collections throughout England.

The system of arrangement we have adopted is that of the Baron Cuvier, with certain modifications, which is undoubtedly the best at the present moment. The system of Macleay, when properly followed out, will probably however supersede all others. The attempts which have as yet been made are very unsatisfactory, the best is that of Vigors. Mr. Swainson in trying to find out his analogies, does not on many occasions at all take into consideration the possibility of many groups of birds having disappeared from the surface of our globe. His views, no doubt, are very ingenious, but must be received with due caution. We have adopted several of the new genera lately proposed by Vigors, Lesson, Swainson, &c. these we shall notice in their proper place.

When we take a general view of the ornithology of Asia, Africa, Australia, North and South America, we find that it is in a manner unknown. Of Europe and North America we have no doubt complete lists of the species, but the remarks on their distribution are of a loose, and unsatisfactory nature. The local *Faunas* published are few in

number, and in general they have not been drawn up with that care and precision, and upon the system, now necessary, authors being content in mentioning the mere occurrence of the species. In regard to the birds of Britain, we have some good details in the works of Montague, Yarrel, Fleming, Selby, Jenyns. Again the works of Temminck, Naumann, Buhm, Berger, Gould, &c., afford us some valuable information upon the birds of Europe generally. The ornithology of Asia has not attracted the particular attention of any naturalist, at least we have no complete work. In the writings of Horsfield, Raffles, Sonnerat, Leschenault, Duvaucel, Diard, Sykes, Vigors, Franklin, Gould, Hodgson, Dussumier, Belanger, Boié, Kuhl, Van Hasselt, &c.,—some of whom forfeited their lives in the pursuit of this their favourite study—we have many valuable details.

In regard to the birds of Africa, the works of Le Vaillant stand pre-eminently forward, and which have increased much our knowledge in this department; but his researches are almost entirely confined to the southern part of that continent. To Dr. Smith we are also indebted for much valuable information, and we look forward with much interest to his work, which is soon to issue from the press. Mr. Swainson has added a little to our knowledge in regard to the birds of western Africa, but there is still a vast deal to be done in this quarter. Ruppell has published some excellent observations on the birds of Nubia and Abyssinia, and the ornithology of Egypt has been partially elucidated by Savigny in his great work.

To Australia the same remark applies. We have no complete general work. From the writings of Brown, Lewin, White, Vigors, Horsfield, King, Phillips, Lesson, Quoy, Gaimard, Poren, Lansdorf, Gould, much valuable information may be obtained. The last individual mentioned is at present engaged publishing a work, illustrated with figures of the heads of the birds of New Holland, and we hope soon to have a complete *Fauna* from the same author, who is at present travelling through that country in order to illustrate its zoology.

The northern half of the new world has received much greater attention, and its ornithology is better known than any other continent with the exception of Europe. For this we are indebted to the indefatigable exertions of Wilson, Audubon, Prince Lucien Bonaparte, Nuttal, Ord, Richardson, Swainson, Sabine, Ross, Douglass, Lichtenstein, &c.

With regard to the ornithology of the southern continent of America, we are lamentably deficient in information. From the writings of Spix, Prince D'Neuwied, D'Orbigny, D'Azara, Swainson, some information may be obtained.

From numerous general works much valuable information may be received, to notice all of which would occupy too much space. Among the authors we may mention Temminck, Cuvier, Latham, Shaw, Buffon, Vieillot, Lesson, Wagler, Jardine, Selby, Drahiez, Lichtenstein, Illiger &c. To Illiger, however, we are indebted for having first taken up the particular subject of ornithological distribution, and which he has handled in a masterly manner, in a paper published in the transactions of the Royal Academy of Berlin; nor did he direct his attention to the distribution of the ornithological kingdom alone. In the same transactions we find him discussing mammalia in a similar manner. Illiger, however, in his paper on birds only notices the distribution of about three thousand species, being little more than one-half of what is now known; and, moreover, most of his observations are now inaccurate, our information in this department being much more extensive. Prince Lucien Bonaparte has lately published some observations upon this subject, but probably too general to be of much value; and, lastly, we may state that Mr. Swainson has lately devoted some attention to this subject, with what success, we shall afterwards have occasion to point out; in the mean time we may remark, that most of the observations which he has published seem to be more for the purpose of supporting a favourite theory, than tending to advance ornithological geography.

We cannot omit noticing that several excellent monographs of particular families have been published, among which we would particularly mark out those of Wagler and Kuhl, upon the *Psittacidæ*—Lesson on the *Trochilidæ*—Gould on the *Rhamphastidæ* and *Trogonidæ*—and also Wagler's System a Avium, which may be considered as a series of monographs brought into one focus. A continuation of this work will be found in Oken's Isis. Numerous papers on genera and species have been published in the transactions of various Societies and Periodicals, which however we shall notice when we have occasion to consult them.

Having now given a rapid sketch of the present state of ornithology as far as the distribution of birds is concerned, we shall proceed to the subject of our communication.

Birds, considered geographically, may be divided into four grand divisions, viz. 1st. Those which are universally distributed; that is, found in all the great continents of the world. 2nd. Those which are generally distributed, or found in three or more continents. 3rd. Partially distributed, or those found in two continents. And 4th. Continently distributed, or those found in but one continent; which last division may be again subdivided with those which are generally distributed throughout the continent, or confined to a part, or island, belonging to that continent.

For these four grand divisions which we have now proposed, and for the purpose of simplification, and to prevent repetition, we have adopted the following terms:—To the first division we apply the term *Katholiko-dianamial;* to the second, *Geniko-dianamial;* to the third, *Adiko-dianamial;* and to the fourth, *Topiko-dianamial.*

In illustration of this arrangement, which we think, in conjunction with a continual tabular view, is well adapted for tracing the distribution of the ornithological kingdom, we may notice a few examples. Belonging to our first, or *Katholiko-dianamial* division, we have the genera *Falco, Turdus, Anas, Columba, Fringilla, Muscicapa, Corvus, Hirundo, Ardea,* &c. To our second, or *Geniko-dianamial* division, belong the genera *Vultur, Picus, Mycteria, Phœnicopterus, Trogon, Upupa, Oriolus, Tetrao nacifraga,* &c. To our third, or *Adiko-dianamial* division, belong the genera, *Bucco, Trochilus Ocypterus, Accentor, Buceros,* &c. And to our fourth, or *Topiko-dianamial* division, belong the genera *Sericulus, Buphaga, Eurylaimus, Menura, Alectura, Musophaga, Calyptomina* &c.

No doubt objections may be thrown out against the system of arrangement now proposed, in particular in regard to the last two divisions; for in nearly all the continents we have tropical, temperate, and arctic climates; and it is seldom that genera extend throughout all these; nor do we mean to infer this; all that we suppose is, that species belonging to any particular genus noticed extend more or less over that continent.

Birds of prey from the most early times have been divided into two grand divisions, viz. the Diurnal and the Nocturnal; the former comprehending the Vultures and Hawks; the latter the Owls. We shall therefore first notice the Vultures.

Vultures taken as a whole belong to our second, or *Geniko-dianamial* division, being found in all the continents of the world, with the exception of New Holland; true Vultures never being found in it, as far as we are aware, their distribution not extending further in that direction than the Indian islands. No doubt Mr. Swainson has described his rasorial type of the Vultures as peculiar to this continent. With all due deference to Mr. Swainson as a naturalist, we cannot but state that we have here a most extraordinary instance of the danger of being misled by a favourite theory, for in this instance Mr. Swainson is as much entitled, in fact more so, to consider the common wild Turkey of North America as his rasorial type of that group; it presenting a greater analogy to the Vultures than the *Alectura,* Latham, which in its habits and manners is a true gallinaceous bird.

But although the Vultures considered as a family present a very

extensive distribution, yet in their subdivisions they are more restricted; for we find the Vultures, properly so called, entirely in the Old world, their place being supplied in the New by the species of the genus *Sarcoramphus*. Nor do the different divisions of the Vultures stand thus alone in representing each other in the different continents, it being a law extending through many groups of the ornithological system. Thus the *Platyrhynchi* of the New world are represented in Asia by the *Eurylaimedæ*. The *Pardalotidæ* of Australia are represented in Asia by the *Calyptominedæ*, and in the New world by the *Piprinæ*. The *Buccomidæ* of Asia are represented in Africa by the *Pogonidæ*, and in the new world by the *Tamatiadæ*. The *Rhamphastidæ* of South America are represented in Asia and Africa by the *Buceridæ*, and in Australia by the *Scythropidæ*. The *Oriolidæ* of the Old world are represented by the *Quiscalidæ* in the New, which group, with one exception, as in the *Piprinæ*, is confined to America. The *Melleagridæ* of America are represented in Africa by the *Namidæ*, in Asia by the *Phananidæ*, and in Australia by the *Alecturidæ*. And, lastly, the *Struthionidæ* of Africa are represented in America by the *Rheadæ*, in Australia by the *Casuaridæ*, and in Europe and Asia by the *Otidæ*. Numerous other examples could be given, but there are still a great many genera which form as it were isolated examples to individual continents, and for which we cannot find any representations. Thus we have no tribe in New Holland to represent the *Picianæ*; no tribe in Europe to represent the *Psittacidæ*; no tribe in Asia, Australia, or America to represent the *Scopidæ* of Africa; and, in fine, no tribe in any of the other continents to represent the *Musophagidæ* or *Gypogeranidæ* of Africa. Whether there ever existed in the different continents groups representing each other to a greater extent than we have at present, will probably remain a mystery, even although organic remains should be found; birds not presenting in their osteology, at least in many cases, sufficiently marked characters. Comprehended in the genus Vulture, properly so called, we have eleven species; of those, three are found in Europe, but none proper to it, being also found in Asia and Africa; in Asia six, three of which are properly, one of them being also found in the Indian islands; in Africa eight, five of which are proper; supplying their place, as already stated, we have in the New world *Sarcoramphi*, of which there are four species common to North and South America, if the opinion of Nuttal is correct in regard to the occurrence of the Condor in the North American continent. It is probable however that it may have been confounded with the *Sarcoramphus Californianus*, a nearly allied species. The *Sarcoramphus papa* seldom goes as far north as the United States; Bonaparte states that it is occasionally met with in Florida, which is pro-

bably its northern limit. It is described by D'Azara as common in Paraguay, but he states it does not pass the 32° of south latitude; in the intermediate countries it appears to be very abundant. The genus *Cathartes*, consisting of two species, is also confined to North and South America, its place being supplied in the Eastern hemisphere by the genus *Neophron*, represented by the *Neophron perenopterus*, a species common to Europe, Asia and Africa.

Adding together the species belonging to the different divisions of Vultures, we have thus only eighteen known; a small proportion when compared either to the Falcons or Owls, but the numbers in which they occur fully compensate for this. The warmer regions of Africa and Asia must be considered as the metropolis of the Vultures, properly so called.

We now enter upon the second division of the *Falconidæ*, which has been divided by the Baron Cuvier into two grand divisions, viz. the noble and ignoble Birds of Prey; the former comprehending the Falcons, properly so called, the latter the Eagles, *Hierofalco.*

The *Falconidæ* considered as one group, possess very extensive distribution, belonging to our *Katholiko-dianamial* division, occurring from the 80° of north latitude to the equator, and from the equator to the 55° of south latitude, and in all the intermediate spaces; yet when taken generically, many of them, as in the *Vulturidæ*, have a rather restricted distribution.

Of the genus *Falco*, properly so called, we have representatives in all the different continents, but in Europe we meet with the greatest number of typical species; not one of which, however, is confined to it. Thus of the forty-four species contained in the genera *Falco*, *Hierofalco*, *Hierax*, *Harpagus*, *Lophotes*, and *Erythropus*, nine are found in Europe, of which two are proper to it, belonging, one to the genus * * * the other to the genus *Erythropus;* in Asia twelve, five of which are proper, three of these found also in the Indian islands; in Africa eighteen, eleven of which are proper; in Australia five, and four proper; in North America five, and one proper; and in South America twelve, and of these ten proper. Of the other seven species found in Europe, but not proper to it, three are common to Europe and Asia, one common to Europe, Asia, and North America, one common to Europe and North America, one common to Europe and Africa, and one common to Europe, Australia(?), North and South America.

It may be laid down as a well ascertained fact, that birds of temperate, and many birds of arctic, countries—that is, those birds which are known to breed there—possess a much wider distribution than those

* Word illegible in M.S.—Eds.

of tropical countries; for in very few instances do we find birds of tropical countries extending their migrations to temperate countries,—a statement which is applicable to more than a third of the birds of Europe. But although we find these European birds inhabiting regions within the tropics, yet we in general find them in those places whose mean annual temperature is little above that of Europe, caused either by the position or form of the country. To this rule however we have several exceptions, as in the *Sturnus vulgaris*, *Pastor roseus*, *Oriolus galbula*, which inhabit both tropical and temperate regions, although probably more abundant, at least the last two mentioned, in the former. It may also be noticed as a curious fact, the reason for which is yet unexplained, viz. that the European species which are found in tropical countries are in general smaller, although identical in every other character with the same bird found in Europe; in other cases we find them not only smaller, but at the same time undergoing slight modifications, which, however, are permanent, and therefore entitling us to consider them as new species and the representatives, in the particular regions in which they are found, of the European. Such is the case with regard to the Nut-hatch, Blackbird, Goldfinch, Siskin, Nut-cracker, Field-fare, Music Thrush, &c. all of which are found in India. *(To be continued.)*

ART. VIII.—*On the use of Wells, &c. in foundations; as practised by the natives of the northern Doab. By Captain* CAUTLEY, *Superintendent of the Doab Canal.*

Piles and caissons being the usual means adopted for foundations in Europe, where the soil and substrata are insufficient, I will venture a few remarks on the system adopted in northern India* for the same purpose, especially in the application of hollow cylinders, or wells of masonry. The plan of undersinking wells does not appear to be totally unknown, although it is not practised in England; in fact the only approach to the method upon which I am now about to occupy the pages of this Journal, is exhibited in the works at the Thames Tunnel, at the descent to which Brunel has sunk masonry cylinders "fifty feet in diameter, strongly clamped with iron, &c." the process of effecting which I have no means of describing. Our Upper Indian system, however, is so admirably adapted to the purposes for which it is intended, and so much superior to pileing (caissons I put out of the ques-

* The undersinking of wells, and their use in foundations, is not confined to the northern Doab; it is practised in Bengal and other parts of India.